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ABSTRACT

Information technologies such as computer mediated communication (CMC), virtual reality, and telepresence can provide the communication flow required by high-speed management techniques that high-technology industries have adopted in response to changes in the climate of competition. Intra-corporate CMC might be used for a variety of purposes directed at supporting and generating products. Inter-corporate CMC has to do with the exchange of information among individuals of workgroups at different corporations. Extra-corporate CMC is used to interact with and scan the larger environment. Management applications for virtual reality (VR) have largely not yet emerged. However, there are advances in production, design, training, and testing which have resulted from VR technology. The human side of VR software requires considerable work before real-world applications become prevalent in the business community. The implications of telepresence for high-speed management are far-reaching; telepresence can provide the capability for people in geographically distant areas to interact in real time. The two main problems with telepresence technology are the time lag and presentation of self at the remote site. Information technology has the potential to modify corporate structure and affect corporate values, and so should be of interest to scholars and managers interested in the role of emerging technologies. (Contains 34 references.) (MES)

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Information Technology as the Paradigm High-Speed Management Support Tool: The Uses of Computer Mediated Communication, Virtual Realism, and Telepresence

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Information Technology as the Paradigm High-Speed Management Support Tool: The Uses of Computer Mediated Communication, Virtual Realism, and Telepresence¹

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Abstract

This paper introduces some areas of pertinence to managers in which new information technology can provide competitive advantage. It includes items which are becoming commonplace in many market segments, introduces several areas which are emerging, and speculates about future trends. Throughout the discussion, the focus is on the facilitation of communication through information technology.

Introduction

Changes in the climate of competition at the local, national, and global levels have resulted in an increased need for corporations to compete aggressively for market segments. In high-technology industries, successful corporations have responded to the decreased product life cycle and potential for unanticipated competition by adopting high-speed management techniques (Cushman and King, 1989). High-speed management involves streamlining the corporate organization so that production, marketing, and research and development (R & D) activities may happen concurrently for new products. High-speed management also requires communication flows which are matched to the information needs of involved parties, and which may therefore violate pre-existing organizational barriers to communication.

Current advances in information technology are serving and will continue to serve the purpose of enabling coalignment through the rapid transfer of data, shared corporate culture, and increased participation by key organizational members. This paper discusses information technology and its uses for high-speed management in three areas: computer mediated communication (CMC), virtual realism or virtual reality (VR), and telepresence. CMC is the most advanced of the three in terms of existing installations and concrete examples of usefulness for high-speed management. VR and

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telepresence offer a promise for the future, especially in the areas of coalignment through direct interpersonal communication on a global scale. VR is demonstrating an additional important role in decreasing product development time through simulation and market research.

There are areas relating to information technology which this paper will not discuss in great detail. Electronic Data Interchange or EDI often uses the same physical network as computer mediated communication, but involves the exchange of messages among computers rather than among people. Another area not considered in this paper is computer-supported cooperative work (CSCW) and the variety of "groupware" which has been developed for use in meetings or planning. CSCW is primarily directed at groups which are already co-aligned (work groups, task forces, boards of directors, etc.) and somewhat organized. The focus of the CMC discussion in this work will be on the use of information technology to identify and facilitate coalignment where it might not pre-exist.

This paper should be useful to scholars and managers interested in the role of emerging technologies and their uses for management. Industry sectors are seeing benefits in the many uses of information technology for competing in increasingly hostile market environments, and new corporations and service organizations are arising to exploit the capabilities of such technologies. For this reason, it is anticipated that the "global manager" (Bartlett & Ghoshal, 1992) skills of facilitating coalignment, market responsiveness and flexibility, efficiency, and cross-market competitiveness will become increasingly important for all corporations, regardless of their product and market bases. This paper will introduce methods in use or in development to enable the use of information technology by even the smallest corporation to achieve competitive advantage.

Coalignment through Communication

High-speed management necessitates intensive cooperation among many groups within an organization. For high-speed managers, the daily focus changes from that of a centralized decision maker to that of a coordinator and facilitator. Strategic and tactical market positioning might involve such intra-corporate coalignment, but might also include shared efforts among corporations or interaction with customers. Staying "close" to the customer, and enabling communication among workgroups in organizations who might not otherwise talk, are additional techniques for achieving organizational objectives (Peters & Waterman, 1984).

The key to coalignment is values: for customers, identification of the values which they hold; for work groups, shared values in areas such as quality, production speed, and organizational goals. Values are learned and shared through communication. It follows that increased communication among groups can lead to understanding of each other and facilitate the sharing of values (e.g., Finholt & Sproull, 1990). Shared values are a precursor for effective coalignment.

Communication patterns within organizations examine, among other things, the power structures that may be identified through the flow of messages (e.g., Tichy et al., 1979; Goldhaber & Rogers, 1979). High-speed management necessitates fundamental changes in these patterns -- the breakdown of barriers between, for example, marketing and R&D. By opening the corporate

communication network, which may be augmented through electronic means, innovation may be fostered and competitors beat to the market. Boundary spanners, those who act as gatekeepers between different organizational groups, are encouraged in a high-speed environment for their ability to understand the values and languages of groups and to facilitate coalignment.

The importance of social groups an organizations has long been recognized (e.g., Pincus, 1986; Sproull & Kiesler, 1991). This paper will discuss ways in which social groups, work groups, management groups, and corporate-customer relations can each benefit from the same telecommunications infrastructure. The ability to link geographically (or temporally) distant groups serves more than transnational corporations. Furthermore, the global telecommunication infrastructure which is being developed for data transfer decreases the cost incurred by new participants.

Computer Mediated Communication for Achieving Organizational Objectives

This section examines computer mediated communication (CMC) from three perspectives. Each involves the transfer of data among individuals or groups. First is intra-corporate CMC, which might be used for a variety of purposes directed at supporting and generating products. Inter-corporate CMC has to do with the exchange of information among individuals or workgroups at different corporations. Inter-corporate CMC can serve to facilitate tactical alliances with other corporations, but may also serve the counter-intuitive purpose of sharing expertise with competitors or different market segments. Such cooperation with competitors may be surprisingly beneficial, and is happening with increasing frequency. Finally, extra-corporate CMC is used to interact with and scan the larger environment, including competitors, related markets, and customers. The global communication networks which are in place or being put in place throughout most of the developed world facilitate all these types of CMC, often at minimal cost to the organization.

Computer mediated communication is divided into several types of distinct activities, but they all involve the exchange of messages using a computer or computer network as medium. Activities include electronic mail (email), bulletin board systems (BBS), interactive messaging, and file transfer (for further discussion and elaboration, see Rosenbaum and Newby, 1990).

Intra-Corporate CMC

Intra-corporate CMC refers generally to computer-based communication which might take place among organizational members. This is the most commonly found form of organizational CMC discussed in the literature, and currently has the most impact on coalignment and the generation of a high-speed management environment.

There are two important qualities for CMC which make it effective for management and coalignment purposes: the boundary-free nature of communication, and the asynchronous nature of the interaction. Boundary-free communication means that anyone who feels a need to communicate with anyone else may do so: management is potentially universally available to all employees, and inter-group communication requires no more than the will to send a message.

These ideals might not be achieved in the real world, of course: social barriers exist where technological ones do not, and the ability to send a message does not imply that effective dialog can take place.

The years of mainframe-based CMC and dedicated data networks for the support of CMC are now past. Even the smallest organization can provide electronic mail and file transfer through a local area network (LAN). Dedicated data networks, which were internal to many larger corporations (e.g., IBM's VNET), are being replaced by commercial network service providers such as PSI and Merit. The infrastructure is being further enhanced by the ongoing upgrade of the telephone system to data communication standards using integrated services digital networks (ISDN), which no longer appears as far off as it once did (Churbuck, 1992).

There is no longer any excuse for any corporation which uses computers to hold off on the provision of CMC services. Both cost and ease of use are more favorable than even two years ago. The technology may be configured to allow or disallow any type of message desired, so that social or recreational uses of the computer networks might be avoided if desired. Examples of managerial uses for CMC include meeting planning, direct interaction with individual employees without need for scheduling face-to-face meetings, coordination with other managers, monitoring of work group discussions, and so forth. Employees can share views, coordinate meeting agendas, and remove much of the need for face-to-face interaction for a work group to coordinate activities.

Two general benefits of the use of CMC for intra-organizational communication deserve mention, as they might not be obvious. The first is the decreased reliance on paper trails to get a job done, and the associated speed with which messages may be transferred. In times of cost-cutting and environmental awareness, CMC is an easy alternative to the widespread distribution of printed materials. The second benefit is the contribution to corporate memory that is made by storing data in electronic form versus print form. Printed records are often not filed in any useful way, and have the limitation of having a single physical location. Electronic materials, however, may be centralized for searching by any permitted person. Informal communication can thereby be used to add incrementally to the corporate intelligence. Software solutions for accessing corporate information databases are currently available (Kahle & Medlar, 1991).

Inter-Corporate CMC

The move from internal corporate CMC networks to the use of public networks, and the increased commercialization of Internet, has led to an environment where corporations with more than one location are likely to use an external network for CMC (in some business environments, such as banking, there is a dedicated network for EDI which is used for limited CMC). Such networks are undergoing rapid change in availability and pricing as PTTs (Post, Telephone, and Telegraph services) get involved and the infrastructure is enhanced. One important factor in accessing such networks is that the exchange of data between organizational units is just as easy as exchange with non-organizational sources. The same network which transfers electronic mail between remote offices might be used to send email outside of the organization, or to access the diversity of network services to be found on Internet (Quartermann, 1991).

This access to information resources and persons who are not part of the corporation has several

implications. First is the potential for sabotage or security leaks: organizational members might inadvertently or purposively distribute trade secrets, or outsiders might try to break in (cf. Denning, 1990). Second is the increased danger of the networks being used for recreational or non-work purposes by employees. It is important to note that such use is easily avoided: system administrators have as much control as they desire over what outside resources may be accessed. However, if left unchecked, unrestricted access to the worldwide Internet can result in employees who play interactive computer games or have discussions on current soap operas instead of doing their work. Neither sabotage nor non-work uses of network resources are likely to bring about competitive advantage.

A third implication of access to network resources is the saving factor, though: employees are empowered to search the vast information resources available over computer networks to achieve organizational objectives. Access to free computer software and bug fixes, government databases, and various bibliographic resources and online library catalogs are examples of the types of services which on a global scale far exceed the provisions of even the best equipped corporate library or systems library.

In the computer industry, there are hundreds of corporations of all sizes which choose to give employees access to the Internet. As the nature of Internet users and connected corporations changes, we can expect to see the benefits such companies have found to generalize to other sectors. These benefits mainly have to do with access to non-local expertise: someone creating a program who has a question might not find the answer forthcoming from local systems administrators or the vendor, but be able to get informed answers from dozens of "experts" who read the same public BBS.

The uses of CMC for inter-organizational cooperation should be clear: all of the benefits from intra-organizational CMC may be encountered through groups outside of the organization as easily as from inside. Data may be exchanged, views shared, and planning sessions may be held with a much higher frequency than is usually economically feasible with travel or paper-based communication.

Extra-Corporate CMC

This area was introduced in the previous section, where the benefits of general network access to the thousands of mailing lists, bulletin boards, databases, and information services was discussed. An additional use of CMC for competitive advantage is to get closer to the networked customer. Not all market segments have a customer base which has access to the worldwide computer networks, but many do. The increased proportion of network users who are not technically inclined, or who gain access without the support of a high-tech corporation or university, is indicative of the trend towards a much wider cross-section of the population.

For the corporation, this presents an opportunity to get closer to the customer. A common occurrence in the computer industry is for customer service representatives to use electronic mail to respond to customer queries. Many manufacturers follow discussions on product-oriented discussion groups and respond to customer queries. On Internet-based mailing lists or BBS', manufacturers are permitted to provide information on new products, but may not explicitly

advertise. A more recent occurrence is for the provision of fee-based information services over Internet. Both BRS and Dialog, two of the largest bibliographic database providers, now have internet access points for subscribers. It follows that product-oriented providers will soon have online product listings and ordering capabilities. For the networked organization, as well as the networked customer, there is a definite time advantage in being able to get product information and place orders using the network, rather than using a telephone or mailing a purchase order.

Summary

This section has examined some of the uses for computer mediated communication for achieving organizational objectives. The rapid electronic transfer of messages among any number of parties has important implications for high-speed management, in that it enables managers to both be accessible to whoever needs them, and to make fast contact with whomever necessary. The sophistication of network users (both customers and employees), when combined with the increasing degree of worldwide connectivity through a variety of computer network access points, opens new opportunities for the high-speed manager to stay close to his or her employees, other workgroups in the organization, and customers. The network also provides access to information resources and expertise which is difficult or impossible to find within a single organization.

Virtual Reality for Competitive Advantage

Virtual reality, or VR, has seen widespread coverage in media ranging from *The Wall Street Journal* to *The Village Voice*, from *Mother Earth News* to *Business Week*. Books have been written on the topic which attempt to forecast the emergence of the promise offered by VR (Rheingold, 1991). In fact, the recent hype is an artifact of both media attention and increased accessibility through a number of start-up companies which "mass produce" virtual reality products (where "mass production" is typically measured in the hundreds or thousands of sales, not the millions). The roots of VR go back at least to the 1960's, when computer laboratories at MIT, NASA, and Xerox PARC were striving to expand the capabilities of the human intellect through human-machine symbiosis (e.g., Licklider, 1960; Sutherland, 1963). Management applications for VR have largely not yet emerged. However, there are current advances in production, design, training, and testing which have resulted from VR technology. This section will introduce current areas of research in VR, and speculate about future uses.

The scholarly literature on VR is still in its formative stages. Literatures which have led to VR come from the fields of computer graphics and human computer interaction. Currently, there is little literature to be found in scholarly journals directed specifically at VR, although computer graphics, human-computer interaction, and telerobotics are closely related literatures which do relate (a forthcoming special issue of *J. Communication* will help to fill the gap, as will a number of emerging journals, conferences, and trade publications directed at VR audiences). Some conference proceedings include articles related to VR (e.g., Newby, 1992; ACM SIGGRAPH *Proceedings*, 1992; and ACM SIGCHI *Proceedings*, 1992). One of the best sources for information about the state of the art in VR is the Usenet BBS newsgroup *sci.virtual.worlds* (redistributed as the mailing list virtu-l@vmd.cso.uiuc.edu). Researchers in the field share their experiences and distribute technical reports in this forum. Aside from popular outlets such as

Forbes and Business Week, the management literature has not yet produced any scholarly treatment of virtual reality.

VR: History

Virtual reality has a long history in two application areas: flight simulation (and related areas) and art. Thomas Furness, in the keynote address at the 1991 ACM SIGCHI meeting, described more than two decades of previously classified research on head-mounted display technologies for the Air Force. This pioneering work went almost entirely unpublished (one published source is Furness, 1986), and it did not benefit the general computing community until the late 1980's when Furness left the Air Force and his research was de-classified. In the meantime, advances in computer graphics had made some of the applications which used to require dedicated mainframes and very expensive custom display devices workable on more mundane (but still powerful) computers, and also resulted in the first company to mass-produce and sell VR display and input devices, VPL Research, Inc. The focus of this research, and the lion's share of current efforts for VR, is to provide the user with a feeling of "immersion" in a computer-generated virtual environment.

At the same time that computer scientists were attempting to provide computers and algorithms for interactive computer graphics, and trying to make gesture-oriented input devices and full-immersion output devices, Myron Krueger was working on less ambitious but more immediately solvable problems (Krueger, 1991). Where most of the current efforts in VR are to remove the sense of the present "real" environment (e.g., a computer laboratory), Krueger focused on providing a more interactive environment which people could experience with their own senses. His *VIDEOPLACE* and other systems were rooms in which people would interact with various images on the floor and walls, and were a mix of sophisticated computer technology (e.g. pattern recognizers), video technology, and one or more remote humans to control the experience. Although Krueger provided his environments primarily as artistic attractions, this section will reveal that it is his vision of VR which might have the most impact on high-speed managers, more so than full immersion environments which are often the focus of articles in the popular media.

VR: Current Capabilities

Interactive computer graphics is not yet at the point where realistic-seeming worlds can be generated in real time. Computer animation can produce realistic computer-generated images, but each frame of a scene may take minutes or hours of computer time to produce. Current virtual worlds have the appearance of cartoon images: few colors are used and objects have angular appearances without the benefit of shading, varied material types, and real-world lighting models. Even so, laboratories researching VR often use the most sophisticated (and expensive) special purpose graphics computers available.

The focus on three-dimensional output devices in VR has resulted in a few off-the-shelf applications, and potential for custom development, in the area of computer automated design (CAD). Through the use of special glasses which present slightly different images to each eye, 3D CAD workstations enable the designer to see a three-dimensional design drawing in three dimensions. Such workstations usually are not full "immersion" systems, in that the designer still

perceives his or her physical surroundings. A 3D mouse may be used to create and manipulate the image.

Architects may also have immediate benefit from VR technologies. Virtual walk-throughs of simulated buildings can provide both building designers and clients the benefit of experiencing a building before it is built, resulting in decreased costs to make architectural changes. This and other applications such as medical imaging are discussed in Fisher (1990). For high-speed management, these technologies offer a shortened design and development time, and enable prototyping and testing to take place before a physical prototype is made.

Current VR capabilities involve high costs and relatively low quality output. Decreased costs and the mass-marketing of cheaper input and output devices will result in this technology becoming more accessible to smaller businesses, even as they begin to realize the potential benefits of international marketing (Porter, 1986). However, an additional step is still needed: the generation of real-world applications which meet the current needs of business. Although some employees will be able to benefit from immersion technology, more will not. Contrary to visions of science fiction writers and some scholars, it seems unlikely that the virtual desktop will replace current information technology (spreadsheet software, word processors, database managers, etc.) in the near future.

VR: Futures

As discussed in the previous section, the primary impediments to the widespread use of VR in a large number of industries are hardware and software. Both exist, but have a high-cost and lack ease of use. This subsection mentions some potential applications which might result from decreased cost and increased availability. The following section on telepresence mentions additional applications.

For CAD, there is a clear focus on simulation. Were these simulated environments more realistic, they could be used for sales and marketing. Virtual showrooms would allow car buyers to see how their car could look with particular color schemes. Virtual real estate agents could show houses on the other side of the country to prospective buyers. Customers could select the specific look and feel of a product before it was custom manufactured for them. VR offers competitive advantage to corporations which are able to exploit the technological capabilities to either design their product faster or bring the product closer to the customer. Although there might be an initial advantage gained by the first corporations to bring such capabilities to the public, it may be anticipated that the enduring benefits will be in these two areas. Industries which will benefit soonest from VR technology include medicine (Fuchs et al., 1988), CAD, architecture, interior design, and other areas which involve a clear transition path from immersion in a "real" world to interaction with a virtual world.

Simulation and design techniques employing virtual reality technology can result in yet another source of increased speed to market for high-speed manufacturing. This will be primarily through decreased time in testing and market research. Design teams will be able to fine-tune new products without waiting for prototype development, and focus groups or other forms of market research can give potential customers direct control and feedback over design options. Through the use of

virtual reality tools, there is potential for a profound decrease in the number of product flaws (either through design or marketing) which result in loss of sales or missing the target audience.

For managers, virtual information systems would provide immersion in all sorts of data needed to make decisions (e.g., Newby, 1992). Three-dimensional depictions of data could be manipulated using hand gestures or voice commands, and be viewed from any angle. Most of the difficulty in achieving these and related applications is in the system design -- computer programs can be written to do what is necessary, and hardware will eventually catch up. However, there are fundamental difficulties being experienced by VR researchers in determining design specifications for systems which are intuitive and easy to use. Currently, even the simplest of simulations might involve awkward hand gestures or key commands to navigate. The human side of virtual reality software requires considerable work before real-world applications become prevalent in the business community, regardless of the state-of-the-art in hardware, software, and display capability.

Telepresence: Coalignment through Interaction

Telepresence emerged from efforts of roboticists to control remote machinery from the viewpoint of the machine. Implications for high-speed managers in this area are far-reaching: telepresence can provide the capability for people in geographically distant areas to interact in real time. Like virtual reality, there are limitations in the extent to which people can interact in a natural way in telepresence environments. However, there is not the limitation of VR for reliance on computer graphics. Instead, most telepresence is carried out through the transmission of video and audio signals using existing technology.

Companies such as AT&T offer telepresence services in the form of interactive videoconferencing. Participants arrive at pre-scheduled teleconferencing sites around the world, and view the other sites on television monitors or projection screens. Audio is provided, and may seem to come from the speaker's visual location. Currently, these services cost from hundreds to thousands of dollars per hour -- about the cost of a single business trip.

More advanced models for telepresence involve actual interaction with the remote environment. In such a scenario, people would become "immersed" in the world perceived by the remote robot (or other device providing a point of view), and control it remotely. Such techniques are used to some extent in law enforcement (bomb disposal squads) and outer space. Advances in display technology and control devices are needed to be effective for less "careful" interaction (Hoff et al., 1991).

The two main problems with telepresence technology are the time lag and presentation of self at the remote site. Time lag is almost insurmountable: getting a data signal from New York to Tokyo takes 1/4 to 1 second using ground-station to satellite technology, and can not be decreased by much (at the speed of light, a direct signal through the earth, or along the ground, would still take at least 5/100 second). Software might be able to account for some of the lag by predicting movements by the controller, but there is still little potential for being able to perform typical human tasks such as writing or walking, given the time delay from when the controller "performs"

an action and when she or he perceives the outcome of that action.

The presentation of self is perhaps even more problematic. It is reasonable, given current technology, for a manager or inspector to use telepresence technology to manipulate a robot at a remote site which would move around and transmit the manager's voice. The manager could interact with remote employees, and even visit hazardous sites. The problem is that the remote employees would be interacting with a robot, and would presumably have difficulty in treating it as a manager. (Remember that current robots are far removed from *Star Wars*. They can not walk upright, are not human shaped, and tend to resemble machinery more than intelligent entities. Developments to make robots more human in appearance would result in decreased functionality.)

Telepresence has clear potential to augment current phone, fax, telex, and email communication through full "immersion" in a remote environment. It is difficult to imagine a near-term solution for the problems of having a reasonable presentation of self at the remote site, and even more difficult to think about a telepresent "meeting," where management project themselves to a remote location to interact with other remotely presented managers. Solutions to some of the technological and social problems outlined here, if solved, could give a whole new meaning to Peters & Austin's (1985) "managing by walking around."

Transnational Issues

Brief mention is deserved of some issues for transnational operation in the current legal environment. Previous sections have mentioned the emerging infrastructure throughout the developed world (and in portions of the developing world) to support the level of high-speed data transfer needed for the visions in this paper to be realized (for an example of such a country's story, see van Ryckeghem, 1992). PTTs have been remarkably willing to devote resources to installing the necessary telephone lines and switching devices to make such data transfer possible. This has resulted in some countries, such as Japan and France, exceeding the capabilities of the U.S. in some areas (i.e., ISDN). The legal infrastructure is also moving forward, but not yet at a rapid pace.

Bartlett and Ghoshal (1987), among others, recognized the efficacy of cross-border management. However, corporations of any size seeking to do business internationally should be forewarned of issues of transborder data flow, copyright, export laws, tariffs, and intellectual property issues before starting such business activities (Boss, 1992). There is little standardization for international law, and fewer examples of case law. The technologies, the ethics, and the issues involved in international business are very new, and still emerging. Even the relatively mundane (as compared to VR and telepresence) area of electronic data transfer is remarkably unregulated (Pisciotta & Barker, 1992).

The information technology mentioned in this paper can facilitate global communication and competition with degrees of coalignment which were not previously attainable. However, facilitation by technology can not be taken to imply that whatever is possible to be done, may be done. Every use of information technology, from email to the Space Shuttle program, should first involve consideration of the relevant norms and laws (Erstling, 1992).

Conclusion

Modern information technology is at the center of emerging trends in high-speed management. This paper has examined only a few of the various types of technology found in the workplace today -- other technologies, such as management information systems, decision support systems, expert systems, and artificial intelligence -- have been left from this analysis. The common ground for computer mediated communication, virtual reality, and telepresence is their dual roles in both the present and the future. Present technologies in these areas are seeing widespread use in some of the high-technology industries, with lesser acceptance in other industries. More corporations are acting on the benefits of computer technology in the workplace, though, and it is these relative latecomers which can profit from the infrastructure laid by earlier adopters. The telecommunications infrastructure can support the transfer of data of all types, with cost commensurate with bandwidth. Private carriers or PTTs can be combined with relatively inexpensive local area networking to provide fully-functional telecommunication links to wherever desires. Security and access control systems enable the desired level of inside and outside access to be maintained.

College graduates and many high-school graduates come prepared with basic computer skills (Katz & DeMichiell, 1992). Many are experienced with CMC. Such new employees make ideal candidates for implementing, testing, and eventually sharing the skills needed for these technologies. Information technology has the potential to modify corporate structure, and effect corporate values, and so is not to be taken lightly (Johnson, 1992; Morieux & Sutherland, 1988). However, global competitiveness is not possible without coalignment, and coalignment requires communication. These new information technologies offer both immediate usefulness and promise for the future for the sharing of corporate values, coaligning organizational members, and getting closer to the customer.

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